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# Governing equations for 1D opto-mechanical vibrations of elastic cubical micro-resonators

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## Abstract

© 2017 Informa UK Limited, trading as Taylor & Francis Group In this paper by employing the Lagrangian method, the effect of the radiation pressure on the coupling between the optical and mechanical modes in an elastic cavity is surveyed. The radiation pressure couldn't be considered as an external force because the electromagnetic waves are non-separable part of the elastic media. Due to the deformation of elastic media, the electromagnetic waves is modified as a result of the element velocity. To consider the electromagnetic evolution, it is preferred to employ the Lagrangian method instead of the second Newton's law. Here, using an elastic frame, governing equations on opto-mechanical oscillations in an elastic media are derived. In a specific case, by comparing the results to the other methods, it shown that this method is more accurate because the exchange of electromagnetic waves by regarding the movement of the elastic media due to deform is considered.

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## Keywords

Elastic resonators, Lagrangian method, opto-mechanical coupling